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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/729,838	12/05/2003	Walter D. Micher	KLAIP117/PI155	8320

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BEYER WEAVER LLP/KLA
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OAKLAND, CA 94612

EXAMINER

STOCK JR, GORDON J

ART UNIT	PAPER NUMBER
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2877

MAIL DATE	DELIVERY MODE
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05/18/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/729,838	Applicant(s) MIEHER ET AL.	
	Examiner Gordon J. Stock	Art Unit 2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9,32-35,40-48,51,52,57-64,87-90 and 95-101 is/are pending in the application.
4a) Of the above claim(s) 43-45,51,52 and 98-100 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9,32,33,40-42,46,47,57-64,87,88,95-97 and 101 is/are rejected.
- 7) ☒ Claim(s) 34,35,48,89 and 90 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>20070427;20070226</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Amendment received on February 26, 2007 has been entered into the record.

Information Disclosure Statement

2. The information disclosure statements (IDS) submitted on February 26, 2007 and April 27, 2007 have been considered by the examiner.

Drawings

3. The Drawings received on February 26, 2007 have been accepted by the Examiner.

Claim Objections

4. **Claim 1** is objected to for the following: on lines 7, 9, 11, and 13 'structures portions' should read –structures' portions-; on line 15 'differ from Xb' should read –differs from Xb-; on line 19 'technique' should read –technique-; and on line 22 'an optical apparatus that comprising' should read –an optical apparatus that comprises-. Corrections required.
5. **Claims 43-45, 51, 52, 98-100** are objected to for the following: their identifier should read –withdrawn- rather than 'original.' See action: 20060915. Corrections required.
6. **Claim 47** is objected to for the following: on lines 7, 9, 11, and 13 'structures portions' should read –structures' portions-; on line 15 'differ from Xb' should read –differs from Xb-; on line 25 'zero'th' should read –zeroth-. Corrections required.
7. **Claim 57** is objected to for the following: on line 4 'the targets A,B, C, and D' lacks antecedent basis. Examiner suggests using –targets A,B, C, and D-. On lines 13, 15, 17, and 19 'structures portions' should read –structures' portions-; and on line 21 'differ from Xb' should read –differs from Xb-. Corrections required.

Claim Rejections - 35 USC § 112 and - 35 USC § 101

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

9. **Claims 46, 58, 59, 101** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
10. As for **claim 46**, **claim 46** recites the limitation "determining the properties P1 and P2" in line 1. There is insufficient antecedent basis for this limitation in the claim.
11. **Claims 58 and 101** are rejected under 35 U.S.C. 112 second paragraph as being indefinite, for **claims 58 and 101** claims both determination steps and the apparatus limitations of **claim 57**. A single claim which claims both an apparatus and the method steps of using the apparatus is indefinite under 35 U.S.C. 112, second paragraph. *In Ex parte Lyell, 17 USPQ2d 1548 (Bd. Pat. App. & Inter. 1990)*. **Claim 59** is rejected for depending from a rejected base claim.
12. **Claims 58, 59, 101** are rejected under 35 U.S.C. 101 based on the theory that **claims 58, 59, 101** are directed to neither a "process" nor a "machine," but rather embrace or overlap two different statutory classes of invention set forth in U.S.C. 101 which is drafted so as to set forth the statutory classes of invention in the alternative only. *Id.* at 1551.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

15. **Claims 1-9, 32, 33, 40-42, 46, 57-64, 87, 88, 95, 96, 97, and 101** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)**—previously cited in view of **Nikoonahad et al. (2002/0093648)** and **Rovira et al. (6,713,753)**

As for **claims 1, 32, 33, 57, 87, and 88**, Yang in a method and apparatus for using an alignment target with designed in offset discloses the following: providing targets A, B, C, D that each include a portion of the first and second structures on a first and second layer of a sample (Fig. 15: 252, 254, 256, 258); wherein the target A (Fig. 15: 252) is designed to have an offset Xa, D, between its first and second structures portions (Fig. 15: 252, D); wherein the target B (Fig. 15: 254) is designed to have an offset Xb, -D, between its first and second structures

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portions (Fig. 15: 254, -D); wherein the target C (Fig. 15: 256) is designed to have an offset X_c , $D + d$, between its first and second structures portions (Fig. 15: 256, $D + d$); wherein the target D, (Fig. 15: 258) is designed to have an offset X_d , $-D-d$, between its first and second structures portions (Fig. 15: 258, $-D-d$); wherein each offsets X_a , X_b , X_c , and X_d is different from zero (Fig. 15: D , $-D$, $D+d$, $-D-d$ are not zero); X_a , D , is an opposite sign and differ from X_b , $-D$ (Fig. 15: D from the mirror image of $-D$); X_c , $D+d$, is an opposite sign and differs from X_d , $-D-d$ (Fig. 15: $D+d$ from the mirror image of $-D-d$); illuminating the targets A, B, C, and D with EM radiation to obtain spectra S_a , S_b , S_c , and S_d from targets A-D respectively (col. 16, lines 38-40; Fig. 12a-12c: 122, 141, and 146 respectively); determining any overlay error between the first structures and the second structures using linear approximation based on the obtained spectra; wherein, there is a scatterometry module for illuminating the targets; thereby, having a scatterometry technique (Fig. 12c: 145; col. 11, lines 50-55; Fig. 16: equation 8; col. 16, lines 40-50); a processor operable for determining any overlay error (Fig. 12c: 147 and 148); and Yang suggests storing the overlay error in memory (col. 12, lines 21-31; col. 14, lines 50-65). And discloses obtaining the spectra through acquiring radiation using an optical apparatus (Figs. 12a-12c; col. 11, lines 50-55). Yang is silent concerning the optical apparatus comprising a spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer. However, Nikoonahad in a semiconductor monitoring system teaches using a spectroscopic ellipsometer and spectroscopic reflectometer for overlay measurements (paragraph 0012). And Rovira in a system for determining grating profiles teaches the use of a combined spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer (col. 3, lines 15-30). Therefore, it would be obvious to one of ordinary skill in the

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art at the time the invention was made to have the optical apparatus comprise a spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer in order to evaluate multiple properties of the sample being monitored such as overlay misregistration and a critical dimension.

As for **claims 2 and 58**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 1 and 57**). In addition, Yang discloses determining a difference spectrum D1, R1-R2, from the spectra Sa and Sb (col. 16, lines 40-45; Fig. 16); determining a difference spectrum D2, R3-R4, from the spectra Sc and Sd (col. 16, lines 40-45; Fig. 16); determining any overlay error by performing a linear approximation based on the difference spectra D1 and D2 (col. 16, lines 40-45; equation 8).

As for **claims 3 and 59**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 2 and 58**). In addition, Yang discloses the linear approximation is based on a property P1, reflectance intensity, of the difference spectrum D1 and a property P2, reflectance intensity, of the difference spectrum D2 (Fig. 16; col. 16, lines 40-45).

As for **claim 4**, Yang in view of Nikoonahad in view of Rovira discloses everything as above (see **claim 1**); In addition, Yang discloses wherein each target comprising a grating structure Ga1 having a periodic structures with a period Ta1 disposed at least partially within the first layer and a grating structure Ga2 having a periodic structure with a period Ta2 disposed at least partially within the second layer, wherein Ta1 and Ta2 are substantially identical (col. 16, lines 1-25; col. 8, lines 65-67; col. 9, lines 1-15); wherein, the offsets are each produced by offsetting the structures with the period Ta1 with respect to the period Ta2 by the sum of the a first distance, D, and a second distance, 0 or d, wherein the second distance has a smaller

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absolute value than the first distance, 0 or d is smaller than D (Fig. 16: 252: $D + 0$; 254: $-D + 0$; 256: $D + d$; 258: $-D - d$; col. 8, lines 55-65; col. 16, lines 20-35).

As for **claims 5-8 and 60-63**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 1 and 57**). In addition, Yang discloses that the four targets, A-D, may be disposed along a substantially straight line (col. 8, lines 40-55 with Fig. 15: 252-258 and Fig. 35: 1502); wherein, target B is disposed between the target A and the target C, and the target C is disposed between the target B and the target D (suggested in col. 8, line 40-55 with Fig. 35: 1502); are disposed in a two dimensional configuration and the targets A and B are disposed along a first axis, the targets C and D are disposed along a second axis, and the first axis and the second axis (both x directions) are substantially parallel (col. 8, lines 40-55 with Fig. 15: 252-258).

As for **claims 9 and 64**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 1 and 57**). In addition, Yang discloses producing an additional target E, the additional target E including a portion of the first and second structures (Fig. 35: 1502) with an offset Y there between (with Figs. 25a-25b); illuminating the additional target E with EM to obtain spectra and determining any overlay error further based on the spectrum Se (col. 17, lines 30-45 with Figs. 12a-12c).

As for **claims 40-42 and 95-97**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 1, 3, 57 and 59**). In addition, Yang discloses that the spectra comprises EM radiation that is selectively polarized or selectively polarized (Figs. 12a-12c; col. 12, lines 10-20); wherein, the spectra comprises EM radiation that is unpolarized reflected light (Fig. 26a) or polarized with the electric field at an angle with respect to a symmetry axis of at

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least one set of structures (Figs. 12a-12c); wherein, the properties P1 and P2 of the difference spectra are selected from spectral characteristics and intensity (Fig. 16; col. 16, lines 40-67).

As for **claims 46 and 101**, Yang in view of Nikoonahad and Rovira discloses everything as above (see **claims 3 and 59**). In addition, Yang discloses determining properties P1 and P2 comprises obtaining characteristics of the difference spectra: the intensity of reflectance (Fig. 16: col. 16, lines 40-67).

16. **Claim 47** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)**—previously cited in view of **Ausschnitt et al. (5,805,290)**.

As for **claim 47**, Yang in a method and apparatus for using an alignment target with designed in offset discloses the following: providing targets A, B, C, D that each include a portion of the first and second structures on a first and second layer of a sample (Fig. 15: 252, 254, 256, 258); wherein the target A (Fig. 15: 252) is designed to have an offset X_a, D , between its first and second structures portions (Fig. 15: 252, D); wherein the target B (Fig. 15: 254) is designed to have an offset $X_b, -D$, between its first and second structures portions (Fig. 15: 254, $-D$); wherein the target C (Fig. 15: 256) is designed to have an offset $X_c, D + d$, between its first and second structures portions (Fig. 15: 256, $D + d$); wherein the target D, (Fig. 15: 258) is designed to have an offset $X_d, -D-d$, between its first and second structures portions (Fig. 15: 258, $-D-d$); wherein each offsets X_a, X_b, X_c , and X_d is different from zero (Fig. 15: D, $-D$, $D+d$, $-D-d$ are not zero); X_a, D , is an opposite sign and differ from $X_b, -D$ (Fig. 15: D from the mirror image of $-D$); $X_c, D+d$, is an opposite sign and differs from $X_d, -D-d$ (Fig. 15: $D+d$ from the mirror image of $-D-d$); illuminating the targets A, B, C, and D with EM radiation to obtain spectra S_a, S_b, S_c , and S_d from targets A-D respectively (col. 16, lines 38-40; Fig. 12a-12c: 122,

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141, and 146 respectively); determining any overlay error between the first structures and the second structures using linear approximation based on the obtained spectra; wherein, there is a scatterometry module for illuminating the targets; thereby, having a scatterometry technique (Fig. 12c: 145; col. 11, lines 50-55; Fig. 16: equation 8; col. 16, lines 40-50); and Yang suggests storing the overlay error in memory (col. 12, lines 21-31; col. 14, lines 50-65). And discloses obtaining the spectra through acquiring radiation using an optical apparatus (Figs. 12a-12c; col. 11, lines 50-55). And Yang discloses that overlay may be determined without a calibration operation, without comparing the measured optical signals to calibration data, or a model-based regression technique, by using a reference offset instead of a modeling process (col. 6, lines 48-54). In addition, Yang discloses the following: using an optical apparatus (Figs. 12a-12c; col. 11, lines 50-55) which may be an imaging spectrometer, an imaging reflectometer (Fig. 26a; col. 13, lines 14-20).

In addition, Yang discloses illumination and a lens (Fig. 26a: 804 and 810). He does not explicitly state the illumination and the numerical aperture of the lens are chosen to optimize instrument performance by ensuring that only zeroth diffraction order is collected. However, the system is a normal incidence reflectometer (Fig. 26a: illuminating normal to the plane of the target), and Yang discloses normal incidence and detection of diffracting light reflected from target (col. 12, lines 5-30). And Ausschnitt in an optical metrology system teaches that the numerical aperture of the system is chosen to ensure zeroth order diffraction light to be collected (col. 7, lines 5-17). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the lens numerical aperture and the illumination at an optimal value to ensure that the normal incidence reflectometer system captures solely the zeroth order

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diffracted light, light reflecting off of the surface normal to incident surface, for greater signal to noise from eliminating non-normal reflected, higher order diffraction orders, from entering the detector.

Allowable Subject Matter

17. **Claims 34-35, 48, 89-90** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and rewritten to overcome any objections mentioned above.

As to **claims 34 and 89**, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method/system for determining overlay an optical apparatus comprising a spectroscopic normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer, in combination with the rest of the limitations of **claims 34 and 89**.

As to **claims 35 and 90**, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method/system for determining overlay an optical apparatus comprising a spectroscopic near-normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer, in combination with the rest of the limitations of **claims 35 and 90**.

As to **claim 48**, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method/system for determining overlay an optical apparatus comprising an imaging spectroscopic ellipsometer, in combination with the rest of the limitations of **claim 48**.

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Response to Arguments

18. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. As for **claims 32, 33, 87, and 88** being previously indicated as comprising allowable subject matter (see action: 20060915), Examiner apologizes for the inconvenience but upon further search a new rejection under 35 U.S.C. 103(a) was made.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: U.S. Patent 6,813,034 to Rosencwaig et al..

U.S. Patent 6,888,632 to Smith

U.S. Patent 6,900,892 to Shchegrov et al.

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

- 1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and
- 2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (571) 273-8300

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431.

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The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

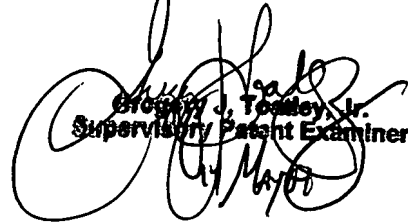
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MS

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May 11, 2007

Gregory J. Toatley, Jr.
Supervisory Patent Examiner
Art Unit 2877



Gregory J. Toatley, Jr.
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